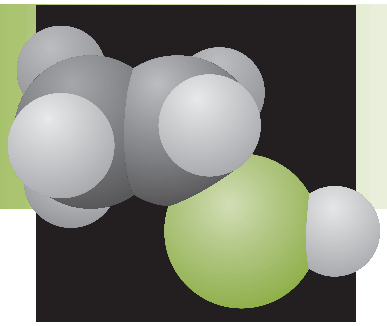
CHEMICALS
Project Fact Sheet



Multi-phase Fluid Dynamics Research Consortium

Benefits

- Improved overall gas-solid flow operating capacity by as much as 90 percent
- Increased capacity of existing gas-solid processes by 10 to 20 percent
- Increased yield of desirable products from dense-phase multi-phase flow processes

Applications

The CFD models developed will be available for use on next-generation computers. Since National Laboratories have computer technology generally 3 to 5 years in advance of industry, industry will be able to apply the technology when it becomes commercially available.

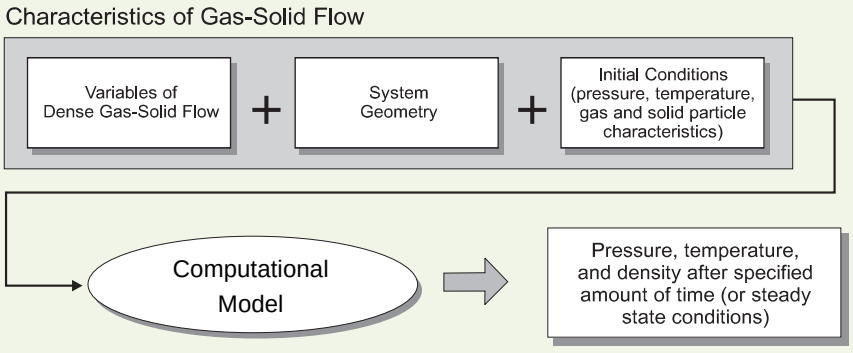
The technology can be applied to any gas-solid flow process involving gas transformation. One of the principal applications is petroleum cracking (the first step in producing fuel and chemicals from petroleum). Improved flow could increase the efficiency of petrochemical processing by up to 5 percent. Improving petroleum cracking efficiency by 1 percent saves 100 million barrels of oil.

Next-generation computational technology will improve productivity in petrochemical industries

Chemical and petroleum industries use multi-phase (gas-solid or gas-liquid-solid) flows in many of their processes. Gas-solid flows are complex, difficult to control and predict, and are the primary cause of down-time in petrochemical industries. Processes that use gas-solid flows operate at an overall industry average of 60 percent capacity, while the average operating capacity for all other processes is 95 percent. Researchers anticipate that models of gas-solid flows using Computational Fluid Dynamics (CFD) can be applied to increase industrial operating capacity.

The Multi-phase Fluid Dynamics Research Consortium (MFDRC) was established to advance CFD beyond the state-of-the-art achievable by any single business or laboratory. The consortium is a partnership between three DOE National Laboratories, five petrochemical companies, an energy equipment manufacturer, and a computer manufacturer. The project currently undertaken by the consortium focuses on dense gas-solid turbulent flows, which are industry's highest priority for CFD modeling. "Dense" refers to a solids content of 5 percent by weight or more in a flowing gas. The R&D will help industry predict flow properties and improve production under industrial conditions. Such predictive capability is not presently available.

Modeling Gas-Solid Flow



Computational models will predict characteristics of gas-solid flow to improve productivity in the petrochemical industry.

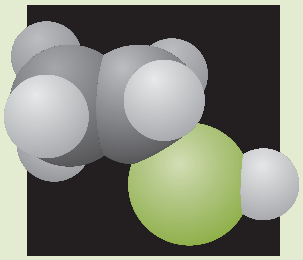
Project Description

Goal: Develop and demonstrate a computer model that can accurately predict turbulent flow in dense gas-solid mixtures.

This project has three major focus areas: (1) modeling and theory led by Los Alamos - they will develop the next generation of computers for multi-phase calculations; (2) experimentation led by Sandia National Laboratories who will provide an industrial-scale test loop for particle and air flow that will become an industrial user center; and (3) flow diagnostics led by Pacific Northwest National Laboratory who will develop sensors and techniques to measure properties of gas-solid flows that will be used in the experimental scale-up. Specific sensors will be developed and marketed as spin-off technology.

Progress and Milestones

- The experimental test loop, designed by Westinghouse, will be installed at Sandia's Albuquerque site, and is expected to be operational by the year 2000.
- Industry will have access to the experimental site after 2001.
- A commercial scientific software business will license and market the computer technology, making the technology widely available to the industry.
- The technology is expected to be commercially available in 2003.



Project Partners

Chevron Research and Technology

Clarkson College of Technology

Dow Chemical

Dow Corning

DuPont

Exxon Research and Engineering

Illinois Institute of Technology

Los Alamos National Laboratory

Pacific Northwest Laboratory

Princeton University

Purdue University

Sandia National Laboratory

SGI/Cray Research

Washington University at St. Louis

Westinghouse Electric Company

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